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WHAT IS CLAIMED IS:

1. An electronic ballast for driving at least one gas discharge lamp from a source of AC power which has a substantially sinusoidal line voltage at a given line frequency, comprising:

a rectifying circuit having AC input terminals and DC output terminals, said AC input terminals connectable to said source of AC power, said rectifying circuit producing a rectified output voltage at its said DC output terminals when said AC input terminals are energized by said source of AC power;

a valley fill circuit having input and output terminals; said input terminals of said valley fill circuit connected to said DC output terminals of said rectifying circuit;

an inverter circuit having input terminals and output terminals; said input terminals of said inverter circuit connected to said output terminals of said valley fill circuit and said output terminals of said inverter circuit connectable to said at least one gas discharge lamp and producing a high frequency drive voltage for driving a lamp current through said at least one gas discharge lamp when said AC input terminals are energized by said source of AC power;

said inverter circuit comprising a single controllably conductive device and an inductor; said inductor connectable to said at least one gas discharge lamp;

said inverter circuit being adapted to draw current from said source of AC power whereby the total current drawn from said source of AC power has a total harmonic distortion below about 33.3%; and

whereby the lamp current has a current crest factor below about 2.1.

2. An electronic ballast for driving at least one gas discharge lamp from a source of AC power which has a substantially sinusoidal line voltage at a given line frequency, comprising:

a rectifying circuit having AC input terminals and DC output terminals, said AC input terminals connectable to said source of AC power, said rectifying circuit producing a rectified output voltage at its said DC output terminals when said AC input terminals are energized by said source of AC power;

a valley fill circuit having input and output terminals; said input terminals of said valley fill circuit connected to said DC output terminals of said rectifying circuit;

an inverter circuit having input terminals and output terminals; said input terminals of said inverter circuit connected to said output terminals of said valley fill circuit and said output terminals of said inverter circuit connectable to said at least one gas discharge lamp and producing a high frequency drive voltage for driving a lamp current through said at least one gas discharge lamp when said AC input terminals are energized by said source of AC power;

said inverter circuit comprising a single controllably conductive device and an inductor; said inductor connectable to said at least one gas discharge lamp;

said inverter circuit being adapted to draw current from said source of AC power whereby the total current drawn from said source of

AC power has a total harmonic distortion below about 33.3%; and whereby the lamp current has a current crest factor below about 1.7.

3. An electronic ballast for driving at least one gas discharge lamp from a source of AC power which has a substantially sinusoidal line voltage at a given line frequency, comprising:

a first rectifying circuit having AC input terminals and DC output terminals, said AC input terminals connectable to said source of AC power, said first rectifying circuit including a first rectifier producing a rectified output voltage at its said DC output terminals when said AC input terminals are energized by said source of AC power;

a valley fill circuit having input and output terminals; said input terminals of said valley fill circuit connected to said DC output terminals of said first rectifying circuit, said valley fill circuit including an energy storage device connected to said output terminals of said valley fill circuit;

an inverter circuit having input terminals and output terminals; said input terminals of said inverter circuit connected to said output terminals of said valley fill circuit and said output terminals of said inverter circuit connectable to said at least one gas discharge lamp, and producing a high frequency drive voltage for driving a lamp current through said at least one gas discharge lamp when said AC input terminals are energized by said source of AC power;

said inverter circuit including a single controllably

conductive device and further including a winding and a second rectifier connected to one another and to said output terminals of said valley fill circuit whereby the maximum voltage across said winding is limited to the instantaneous voltage at said output terminals of said valley fill circuit when said controllably conductive device is non conductive.

4. The electronic ballast of claim 3 wherein said winding contains a plurality of turns and further including a tap connection to one of said turns of said winding; said tap connection connected to said energy storage device and operable to charge said energy storage device to a desired voltage.

5. The electronic ballast of claim 4 wherein said electronic ballast draws a ballast input current from said source of AC power and said tap is located on a turn of said winding which is selected to minimize the total harmonic distortion of said ballast input current.

6. The electronic ballast of claim 4 wherein said tap is located at an approximately middle turn of said plurality of turns of said winding.

7. The electronic ballast of claim 4 wherein said tap is located at a turn on said winding which is selected to minimize the current crest factor of said lamp current.

8. An electronic ballast for driving at least one gas discharge lamp from a source of AC power which has a substantially sinusoidal line voltage at a given line frequency, comprising:

a first rectifying circuit having AC input terminals and DC output terminals, said AC input terminals connectable to said source of AC power, said first rectifying circuit including a first rectifier producing a rectified output voltage at its said DC output terminals when said AC input terminals are energized by said source of AC power;

an inverter circuit having input terminals and output terminals; said input terminals of said inverter circuit connected to said output terminals of said first rectifying circuit and said output terminals of said inverter circuit connectable to said at least one gas discharge lamp, and producing a high frequency drive voltage for driving a lamp current through said at least one gas discharge lamp when said AC input terminals are energized by said source of AC power;

said inverter circuit comprising a single controllably conductive device, a second rectifier and a transformer; said transformer including a first and second winding; said first winding connected to said DC output terminals of said first rectifying circuit through said second rectifier, whereby the voltage on said first winding is limited to the voltage at said input terminals of said inverter circuit during a non-conductive state of said single controllably conductive device, and further wherein the voltage on said first winding determines a maximum voltage stress on said single controllably conductive device during a

non-conduction state of said single controllably conductive device, and establishes a maximum instantaneous voltage on said second winding of the transformer during a non-conduction state of said single controllably conductive device; said second winding being connected to said single controllably conductive device.

9. The electronic ballast of claim 8, which further includes a third winding coupled to said first and second windings; said third winding producing a high frequency drive voltage for driving a lamp current through said at least one gas discharge lamp when said AC input terminals are energized by said source of AC power.

10. The electronic ballast of claim 8 wherein said first winding produces a high frequency drive voltage for driving a lamp current through said at least one gas discharge lamp when said AC input terminals are energized by said source of AC power.

11. The electronic ballast of claim 8 wherein the second winding produces a high-frequency voltage for driving a lamp current through said at least one gas discharge lamp when said AC input terminals are energized by said source of AC power.

12. An electronic ballast for driving at least one gas discharge lamp from a source of AC power which has a substantially sinusoidal line voltage at a given line frequency, comprising:

a rectifying circuit having AC input terminals and DC output terminals, said AC input terminals connectable to said source of AC power, said rectifying circuit producing a rectified output voltage at its said DC output terminals when said AC input terminals are energized by said source of AC power;

a valley fill circuit having input and output terminals; said input terminals of said valley fill circuit connected to said DC output terminals of said rectifying circuit, said valley fill circuit including an energy storage device connected to said output terminals of said valley fill circuit;

an inverter circuit having input terminals and output terminals; said input terminals of said inverter circuit connected to said output terminals of said valley fill circuit and said output terminals of said inverter circuit connectable to said at least one gas discharge lamp, and producing a high frequency drive voltage for driving a lamp current through said at least one gas discharge lamp when said AC input terminals are energized by said source of AC power;

said inverter circuit comprising a clamp winding coupled to said energy storage device whereby said clamp winding diverts current to said energy storage device to recharge said energy storage device, wherein said current diverted by said clamp winding is the only current which recharges said energy storage device.

13. An electronic ballast for driving at least one gas discharge lamp from a source of AC power which has a substantially

sinusoidal line voltage at a given line frequency, comprising:

a rectifying circuit having AC input terminals and DC output terminals, said AC input terminals connectable to said source of AC power, said rectifying circuit producing a rectified output voltage at its said DC output terminals when said AC input terminals are energized by said source of AC power;

an inverter circuit having input terminals and output terminals; said input terminals of said inverter circuit connected to said output terminals of said rectifying circuit;

an output circuit having input terminals and output terminals; said input terminals of said output circuit connected to said output terminals of said inverter circuit; and said output terminals of said output circuit connectable to said at least one gas discharge lamp;

said inverter circuit producing a high frequency drive voltage for driving a lamp current through said at least one gas discharge lamp when said AC input terminals are energized by said source of AC power;

said inverter circuit comprising a single controllably conductive device and an inductor connected in series with one another and to said input terminals of said inverter circuit;

said output circuit comprising a resonant tank, whereby said electronic ballast draws a ballast input current from said source of AC power and said ballast input current total harmonic distortion is reduced below about 33.3%; and

further including a valley fill circuit having input and output

terminals; said input terminals of said valley fill circuit connected to said DC output terminals of said rectifying circuit.

14. An electronic ballast for driving at least one gas discharge lamp from a source of AC power which has a substantially sinusoidal line voltage at a given line frequency, comprising:

a rectifying circuit having AC input terminals and DC output terminals, said AC input terminals connectable to said source of AC power, said rectifying circuit producing a rectified output voltage at its said DC output terminals when said AC input terminals are energized by said source of AC power;

an inverter circuit having input terminals and output terminals; said input terminals of said inverter circuit connected to said output terminals of said rectifying circuit and said output terminals of said inverter circuit connectable to said at least one gas discharge lamp, and producing a high frequency drive voltage for driving a lamp current through said at least one gas discharge lamp when said AC input terminals are energized by said source of AC power;

said inverter circuit comprising a single controllably conductive device;

a control circuit coupled to said single controllably conductive device and operable to enable and disable conduction of said device for controllable lengths of time; said controllable lengths of time when conduction is enabled being reduced during a time around a time of a peak of an absolute value of said substantially sinusoidal line

voltage whereby the current crest factor of said lamp current is reduced from that which would have occurred in the absence of said reduction of the controllable lengths of time when conduction is enabled, wherein said reduction of said controllable lengths of time when conduction is enabled is further selected to keep the ballast input current total harmonic distortion below about 33.3%.

15. The electronic ballast of claim 14 wherein said reduction of said controllable lengths of time when conduction is enabled is further selected to keep the ballast input current total harmonic distortion below about 20%.

16. An electronic ballast for driving at least one gas discharge lamp from a source of AC power which has a substantially sinusoidal line voltage at a given line frequency, comprising:

a rectifying circuit having AC input terminals and DC output terminals, said AC input terminals connectable to said source of AC power, said rectifying circuit producing a rectified output voltage at its said DC output terminals when said AC input terminals are energized by said source of AC power;

an inverter circuit having input terminals; said input terminals of said inverter circuit connected to said output terminals of said rectifying circuit;

an output circuit having input terminals and output terminals; said input terminals of said output circuit connected to said output terminals of said inverter circuit; and said output terminals of

said output circuit connectable to said at least one gas discharge lamp;

said inverter circuit producing a high frequency drive voltage for driving a lamp current through said at least one gas discharge lamp when said AC input terminals are energized by said source of AC power;

said inverter circuit comprising a single controllably conductive device and a first inductor connected in series with one another and to said input terminals of said inverter circuit;

said output circuit comprising a second inductor, whereby said electronic ballast draws a ballast input current from said source of AC power and said ballast input current total harmonic distortion is reduced below about 33.3%; and

further including a valley fill circuit having input and output terminals; said input terminals of said valley fill circuit connected to said DC output terminals of said rectifying circuit.

17. The electronic ballast of claim 1, which further includes a cat ear circuit connected to said source of AC power; said cat ear circuit being adapted to conduct current from said source of AC power for a first relatively short time following a first zero crossing of said substantially sinusoidal line voltage and for a second relatively short time prior to the next zero crossing of said line voltage thereby to reduce the ballast input current total harmonic distortion from that which would occur in the absence of said cat ear circuit.

18. The electronic ballast of claim 17 wherein the total current drawn from said source of AC power has total harmonic distortion below about 20%.

19. The electronic ballast of claim 17 wherein said cat ear circuit draws current from said source of AC power only when an instantaneous value of said line voltage is less than a predetermined absolute value.

20. The electronic ballast of claim 17 wherein said cat ear circuit draws current from said source of AC power at least during a time when an instantaneous value of said line voltage is less than a predetermined absolute value.

21. The electronic ballast of claim 17 wherein said cat ear circuit draws current from said source of AC power at least when said current drawn by said inverter circuit is substantially zero.

22. The electronic ballast of claim 13, which further includes a cat ear circuit connected to said source of AC power; said cat ear circuit being adapted to conduct current for a first relatively short time following a first zero crossing of said line voltage and for a second relatively short time prior to a next zero crossing of said line voltage.

23. The electronic ballast of claim 13, which further

includes a cat ear circuit connected to said source of AC power; said cat ear circuit being adapted to conduct current for a first relatively short time following a first zero crossing of said line voltage and for a second relatively short time prior to a next zero crossing of said line voltage thereby to reduce the ballast input current total harmonic distortion from that which would exist in the absence of said cat ear circuit.

24. The electronic ballast of claim 13 wherein the electronic ballast does not include a boost converter circuit.

25. The electronic ballast of claim 16 wherein the electronic ballast does not include a boost converter circuit.

26. The electronic ballast of claim 13 further comprising:

a control circuit coupled to said single controllably conductive device and operable to enable and disable conduction of said device for controllable lengths of time; said controllable lengths of time when conduction is enabled being reduced during a time around a time of a peak of an absolute value of said substantially sinusoidal line voltage whereby the current crest factor of said lamp current is reduced from that which would have occurred in the absence of said reduction of the controllable lengths of time when conduction is enabled, wherein said reduction of said controllable lengths of time when conduction is enabled is further selected to maintain the ballast input current total harmonic distortion below about 33.3%.

27. The electronic ballast of claim 26 whereby the ballast input current total harmonic distortion is reduced below about 20%.

28. The electronic ballast of claim 14, which further includes a valley fill circuit having input and output terminals; said input terminals of said valley fill circuit connected to said DC output terminals of said rectifying circuit.

29. The electronic ballast of claim 14, which further includes a cat ear circuit connected to said source of AC power; said cat ear circuit being adapted to conduct current for a first relatively short time following a first zero crossing of said line voltage and for a second relatively short time prior to a next zero crossing of said line voltage.

30. The electronic ballast of claim 14, which further includes a cat ear circuit connected to said source of AC power; said cat ear circuit being adapted to conduct current for a first relatively short time following a first zero crossing of said line voltage and for a second relatively short time prior to a next zero crossing of said line voltage thereby to reduce the ballast input current total harmonic distortion from that which would exist in the absence of said cat ear circuit.

31. The electronic ballast of claim 30 whereby the ballast input current total harmonic distortion is reduced below about 20%.

32. The electronic ballast of claim 28, which further includes a cat ear circuit connected to said source of AC power; said cat ear circuit being adapted to conduct current for a first relatively short time following a first zero crossing of said line voltage and for a second relatively short time prior to a next zero crossing of said line voltage.

33. The electronic ballast of claim 14 wherein said control circuit includes a microprocessor.

34. The electronic ballast of claim 14 wherein said control circuit includes a DSP.

35. The electronic ballast of claim 14 wherein said control circuit includes an ASIC.

36. The electronic ballast of claim 16, which further includes a cat ear circuit connected to said DC output terminals of said rectifying circuit, said cat ear circuit being adapted to conduct current for a first relatively short time following a first zero crossing of said line voltage and for a second relatively short time prior to a next zero crossing of said line voltage.

37. The electronic ballast of claim 16 further including a cat ear circuit connected to said source of AC power; said cat ear circuit being adapted to conduct current for a first relatively short time

following a first zero crossing of said line voltage and for a second relatively short time prior to a next zero crossing of said line voltage thereby to reduce the ballast input current total harmonic distortion from that which would occur in the absence of said cat ear circuit.

38. The electronic ballast of claim 16 further comprising:

a control circuit coupled to said single controllably conductive device and operable to enable and disable conduction of said device for controllable lengths of time; said controllable lengths of time when conduction is enabled being reduced during a time around a time of a peak of an absolute value of said substantially sinusoidal line voltage whereby the current crest factor of said lamp current is reduced from that which would have occurred in the absence of said reduction of the controllable lengths of time when conduction is enabled, wherein said reduction of said controllable lengths of time when conduction is enabled is further selected to maintain the ballast input current total harmonic distortion below about 33.3%.

39. The electronic ballast of claim 37 whereby the ballast input current total harmonic distortion is reduced below about 20%

40. In an electronic ballast for driving at least one gas discharge lamp from a source of AC power which has a substantially sinusoidal line voltage at a given line frequency; the method of reducing the ballast input current total harmonic distortion below about 33.3 %

and of reducing lamp current crest factor below about 2.1, comprising the steps of:

a) rectifying said substantially sinusoidal line voltage from said source of AC power to provide a rectified voltage;

b) producing a DC voltage that is a predetermined percentage of a peak of said rectified voltage;

c) modifying the rectified voltage by supplying said DC voltage between peaks of the rectified voltage to provide a valley filled voltage; and

d) inverting the valley filled voltage in an inverter circuit with a single controllably conductive device to provide a lamp current to drive said at least one gas discharge lamp.

41. The method of claim 40 wherein the step of rectifying comprises providing a full wave rectified voltage.

42. The method of claim 40, which includes the further steps of; drawing additional current through a cat ear circuit from said source of AC power during a first time interval following a line voltage zero crossing and a second time interval just prior to a next line voltage zero crossing thereby to reduce said ballast input current total harmonic distortion to below about 20%.

43. In an electronic ballast for driving at least one gas discharge lamp from a source of AC power which has a substantially

sinusoidal line voltage at a given line frequency; a method for setting a voltage on an energy storage capacitor of a valley fill circuit in said electronic ballast, comprising the steps of:

a) rectifying said substantially sinusoidal line voltage from said source of AC power to provide a rectified voltage;

b) inverting said rectified voltage in an inverter circuit to provide a lamp current to drive said at least one gas discharge lamp; and

c) applying a charging current to said energy storage capacitor of said valley fill circuit solely from a winding in said inverter circuit to charge said energy storage capacitor to a predetermined voltage level.

44. The method of claim 43 wherein the step of rectifying comprises providing a full wave rectified voltage.

45. In an electronic ballast for driving at least one gas discharge lamp from a source of AC power which has a substantially sinusoidal line voltage at a given line frequency; a method for constraining a voltage on a controllably conductive device in a single switch inverter of said electronic ballast, said method comprising the steps of:

a) rectifying said substantially sinusoidal line voltage from said source of AC power to provide a rectified voltage;

b) inverting said rectified voltage to drive a current

through said at least one gas discharge lamp and storing energy in an inductor by applying said rectified voltage to said inductor under the control of said conductive controllably conductive device, and;

c) constraining the voltage on said controllably conductive device to be limited to a predetermined multiple of said rectified voltage when said device is non-conducting by diverting a portion of said energy stored in the inductor into a voltage source.

46. The method of claim 45 wherein the step of rectifying comprises providing a full wave rectified voltage.

47. In an electronic ballast for driving at least one gas discharge lamp from a source of AC power which has a substantially sinusoidal line voltage at a given line frequency; a method for recharging an energy storage capacitor in a valley fill circuit of said ballast; said method comprising the steps of:

a) rectifying said substantially sinusoidal line voltage from said source of AC power to provide a rectified voltage;

b) inverting said rectified voltage to drive a current through said at least one gas discharge lamp and storing energy in an inductor by applying said rectified voltage to said inductor under the control of a conductive controllably conductive device, and;

c) constraining the voltage on said controllably conductive device to a predetermined level when said controllably conductive device is non-conductive, by diverting a portion of said

energy stored in the inductor through a winding into said energy storage capacitor of said valley fill circuit, wherein said energy diverted through said winding is the only energy which charges said energy storage capacitor of said valley fill circuit.

48. The method of claim 47 wherein the step of rectifying comprises providing a full wave rectified voltage.

49. In an electronic ballast for driving at least one gas discharge lamp from a source of AC power which has a substantially sinusoidal line voltage at a given line frequency, a method for reducing a current crest factor of a lamp current provided by said electronic ballast and maintaining the ballast input current total harmonic distortion at or below about 33.3% comprising the steps of:

a) rectifying said substantially sinusoidal line voltage from said source of AC power to provide a rectified voltage;

b) inverting said rectified voltage in an inverter circuit having a single controllably conductive device to provide the lamp current to said at least one gas discharge lamp;

c) reducing the conduction time of said single controllably conductive device during a time around a time of a peak of an absolute value of said substantially sinusoidal line voltage to reduce the value of the current crest factor of said lamp current of said at least one gas discharge lamp below a predetermined value; and

d) restricting the reduction of conduction time of said

single controllably conductive device so that the ballast input current total harmonic distortion is maintained at or below about 33.3%.

50. The method of claim 49 wherein the step of rectifying comprises providing a full wave rectified voltage.

51. The method of claim 49 whereby said predetermined value is reduced to below about 2.1 by selecting said reduction of said conduction time of said single controllably conductive device.

52. The method of claim 49 whereby said predetermined value is reduced to below about 1.7 by selecting said reduction of said conduction time of said single controllably conductive device

53. An electronic ballast for driving at least one gas discharge lamp from a source of AC power which has a substantially sinusoidal line voltage at a given line frequency, comprising:

a rectifying circuit having AC input terminals and DC output terminals, said AC input terminals connectable to said source of AC power, said rectifying circuit producing a rectified output voltage at its said DC output terminals when said AC input terminals are energized by said source of AC power;

an inverter circuit comprising a single controllably conductive device having input terminals connected to said output terminals of said rectifying circuit;

wherein said electronic ballast input current in-rush is inherently limited by the operation of the single controllably conductive device.

54. The electronic ballast of claim 53 wherein said inherently limited ballast input current in-rush is less than about 7 amperes.

55. The electronic ballast of claim 53, wherein said inherently limited ballast input current in-rush is less than about 3 amperes.

56. The electronic ballast of claim 53 wherein said electronic ballast input current in-rush is inherently limited by providing in said inverter circuit an inductance coupled across the input terminals of said inverter circuit, said inductance including a tap, said tap coupled to charge a primary energy storage capacitor of the electronic ballast.